Chapter III: Affected Environment

Introduction

This section presents the analysis topics included in this Cascades Diversion Dam Removal Project Environmental Assessment and a rationale for their inclusion. These topics were selected based on federal law, regulations, and executive orders; National Park Service management policies; and concerns expressed by the public, park staff, or other agencies during scoping and comment periods. This section also provides a discussion of topics that were dismissed from further analysis.

A short rationale for each impact topic considered in this chapter is given below. A description of the existing conditions for each selected topic is provided later in this chapter. The affected environment described in this chapter encompasses the geographical area affected by all of the alternatives. The potential impacts of each alternative within each topic area are presented in Chapter IV, Environmental Consequences.

Impact Topics Considered in this Plan

Natural Resources

The federal and state Endangered Species Acts (and associated legislation), Clean Water Act, Clean Air Act, and National Environmental Policy Act require that the effects of any federal undertaking examine natural resources. In addition, National Park Service management policies and natural resource management guidelines call for the consideration of natural resources in planning proposals. Cascades Diversion Dam is located on the Merced Wild and Scenic River within Yosemite National Park – an area of abundant natural resources. It is therefore necessary to characterize both these natural resources and the environmental consequences to these resources that could result from implementation of Cascades Diversion Dam Removal Project alternatives.

Analysis was performed for the following natural resource topics: geology, geologic hazards, and soils; hydrology, floodplains, and water quality; wetlands; vegetation; wildlife; special-status species; air quality; and noise.

Cultural Resources

The National Historic Preservation Act, the Archeological Resources Protection Act, Native American Graves Protection and Repatriation Act, and the National Environmental Policy Act require that the effects of any federal undertaking on cultural resources be examined. In addition, National Park Service management policies and cultural resource management guidelines call for the consideration of cultural resources in planning proposals. Significant cultural resources exist within the project area and adjacent areas and could be affected by the alternatives. Therefore, analysis was performed for archeological resources, ethnographic resources, and cultural landscape resources, including historic sites and structures.

Social Resources

The analysis of social resources examines the effects of the Cascades Diversion Dam Removal Project on the social environment within the park. Analysis of transportation examines the effects of the Cascades Diversion Dam Removal Project on visitor access to the park. Conserving the park's scenery is a crucial component of the National Park Service 1916 Organic Act and the park's enabling legislation. Stewardship of Yosemite National Park requires consideration of two integrated purposes: to preserve Yosemite's unique natural and cultural resources and scenic beauty, and to make these resources available to visitors for study, enjoyment, and recreation. The National Environmental Policy Act requires that socioeconomic impacts of the Cascades Diversion Dam Removal Project be addressed.

Analysis was performed for the following social resource topics: transportation, scenic resources, recreation, orientation and interpretation, socioeconomics, and park operations and facilities.

Impact Topics Dismissed from Further Analysis

Environmental Justice

No aspect of the action alternatives of the Cascades Diversion Dam Removal Project would result in disproportionately high and adverse human health or environmental effects on minority or low-income populations. Any restriction on travel or access to any area of the park that might result from the Cascades Diversion Dam Removal Project would be equally applied to all visitors, regardless of race or socioeconomic standing. As well, none of the action alternatives would change current management direction concerning housing policy in Yosemite National Park, El Portal, or other areas adjacent to the park. Policies concerning the future availability of housing in these areas are already in place and would not change as a result of the project. Therefore, the action alternatives would not result in destruction or disruption of community cohesion and economic vitality; displacement of public and private facilities and services; increased traffic congestion; and/or exclusion or separation of minority or low-income populations from the broader community.

Natural Resources

Prime and Unique Agricultural Lands

There are no known agricultural lands in the project area, and the project would not have any indirect effects to downstream agricultural lands.

Social Resources

Land Use

Land uses within Yosemite National Park are classified as "Parklands," regardless of the individual types of land uses within the park. Implementation of the project would not affect Parklands land uses within the park.

Public Health and Safety

Public health and safety is not presented as a separate topic in this analysis, since many sections (water quality, recreation, park operations, and others) evaluate park-related public health and safety issues.

Museum Collection

Implementation of elements of the Cascades Diversion Dam Removal Project action alternatives could indirectly affect the museum collections by generating minimal additions to the collections due to archeological data recovery performed as mitigation for direct site impacts. Such additions would require museum storage space and ongoing collections maintenance and management.

Visitor Services

There are no visitor services (overnight accommodations, food service, retail service, or other services) within the area of potential effect of the action alternatives. Implementation of the project would not have any direct or indirect effects on visitor services in adjacent areas.

Night Sky and Wilderness Experience

There is no designated Wilderness within the area of potential effect of the action alternatives. Implementation of the project would not have any direct or indirect effects to designated Wilderness in adjacent areas. No element of the Cascades Diversion Dam Removal Project would affect the night sky within the park.

Regional Setting

Yosemite National Park lies on the western slope of the Sierra Nevada, a massive mountain range dividing central and northern California from more arid lands to the east. The Sierra Nevada ecoregion (which extends through the foothill zone on the west side and the base of the escarpment on the east side) is about 450 miles long and 100 miles wide. Elevations in the park range from approximately 2,000 feet to 13,114 feet. Most of the 747,969 acres of the park is designated Wilderness (94%, or 704,624 acres).

The Merced River flows from the headwaters in the high elevations of the Sierra Nevada, through Yosemite Valley, and down to the San Joaquin Valley, where it contributes to the San Joaquin River. The Merced River contains separate and unique watersheds, sustains separate hydrologic and aquatic resources, and supports differing levels of development. The main stem of the Merced River drains approximately 250,000 acres from the headwaters within the park to the Foresta Bridge in the El Portal area. The main stem of the Merced River flows a total of 140 miles from its headwaters to the confluence with the San Joaquin River. The South Fork drains the southern portion of the park, an area of approximately 76,000 acres. The Tuolumne River drains the northern portion of the park, an area of approximately 435,000 acres.

The major vegetation zones of the Sierra Nevada ecosystem form readily apparent, large-scale, north-south elevational bands along the axis of the mountain range. Major east-west watersheds that dissect the Sierra Nevada with steep canyons form a secondary pattern of vegetation. On the west side, forest types change with increasing elevation, from ponderosa pine to mixed conifer to firs. Straddling the crest of the Sierra Nevada is a zone of subalpine and alpine vegetation. Fire suppression, in concert with changing land-use practices, has dramatically changed natural fire regimes of the Sierra Nevada, altering ecological structures and functions in the Sierra Nevada plant communities (UC Davis 1996a,b,c,d).

Aquatic and riparian systems are the most altered and impaired habitats of the Sierra Nevada. Dams and diversions throughout most of the Sierra Nevada have altered stream-flow patterns and water temperatures. Foothill areas below about 3,300 feet appear to have the greatest loss of riparian vegetation of any region in the Sierra Nevada (UC Davis 1996a,b,c,d).

Recreational opportunities abound in Yosemite National Park in developed and wilderness areas alike; however, the types and quality of activities vary considerably between these two areas. Recreational opportunities are made more memorable because of the natural beauty of Yosemite Valley, El Portal, and wilderness environments. These areas offer a wide range of recreational experiences for the visitor, including hiking, picnicking, camping, climbing, skiing, fishing, photography, swimming, nature study, stock use, bicycling, sightseeing, and rafting. The availability of one or more of these opportunities varies by location.

The four basic categories of park operations are resources management, facility management, visitor protection, and interpretive services. Park infrastructure and facilities include wilderness trails, roads, bridges and tunnels, campgrounds and lodging, and utilities. National Park Service management policies require that all facilities be managed, operated, and maintained to minimize energy consumption of nonrenewable fuels. The policies also require that new energy-efficient technologies be used where appropriate and cost effective.

Local Setting – Cascades Diversion Dam Project Area

Cascades Diversion Dam is located on the main stem of the Merced River in Yosemite National Park, adjacent to the intersection of El Portal Road and Big Oak Flat Road. Other elements of the former hydroelectric generating facility include the river-right and river-left abutments that flank the dam, the intake structure, the screenhouse (located atop the intake), the penstock (which historically conveyed water from the dam to the powerhouse), the powerhouse, and the transmission lines. The Cascades Diversion Dam project area, which is defined as the impoundment segment of the Merced River corridor (the dam, the area from the upstream impoundment to 200 feet below the dam, and surrounding areas) (see figure II-1), consists of approximately 660 feet of stream channel and bank areas that support mixed conifer forest with pockets of riparian and oak woodland plant communities. The Cascades Diversion Dam project area also includes El Portal Road adjacent to the dam area (and wastewater, electrical, and telephone lines under the road), the El Portal Road and Big Oak Flat Road intersection, a parking area on the north side of El Portal Road, and a vehicle turnout west of the screenhouse. The project area also includes Pohono Quarry, located approximately one mile upstream of the dam, to the north of Pohono Bridge and El Portal Road.

Throughout this environmental assessment, the analysis will focus of the impacts of actions within the Cascades Diversion Dam project area for the resource topics presented in this section. However for some resource topics discussed in this environmental assessment (such as noise, air quality, scenic, and wildlife), the local setting may extend beyond the boundaries shown on figure II-1.

Natural Resources

Geology, Geologic Hazards, and Soils

Geology and Geologic History

Cascades Diversion Dam is located immediately upstream of the Merced River gorge, which begins where the gradient of the Merced River abruptly increases and the river enters the gorge. The gorge has remained an incised, V-shaped feature because most recent glacial events did not extend down the Merced River beyond Yosemite Valley.

The granitic rocks within the Merced River gorge consist primarily of tonalite; the Bass Lake tonalite is the dominant bedrock feature. Geologic materials underlying Cascades Diversion Dam and supporting the abutments and the intake structure are believed to be heterogeneous sand and gravel deposits that are underlain by thick (approximately 200 feet), coarse-grained deposits of glacially deposited rock and glacial lake deposits.

Geologic Hazards

The Merced River flows through geologically active areas, where geologic and hydrologic forces continue to shape the landform. Geologic hazards associated with these forces, such as earthquakes and rockfalls, present potentially harmful conditions to visitors, personnel, and facilities in Yosemite National Park.

The Sierra Nevada range of Yosemite National Park is not considered an area of particularly high seismic activity. The project area lies in seismic zone 3, as defined by the Uniform Building Code Seismic Zone Map (International Conference of Building Officials 1997). Throughout recorded history, most earthquakes of Richter magnitude 5 or above have been centered in the eastern Sierra Nevada or in the western portion of California near the San Andreas Fault Zone. A relatively small number of earthquakes over magnitude 5, but many earthquakes under magnitude 5, have been generated in the Sierra Nevada batholith underlying the project area (USBR 1983). No active or potentially active earthquake faults have been identified in the mountain region of Yosemite National Park (CDMG 1990); therefore, the risk of fault rupture or surface displacement beneath the dam is negligible. Yosemite can undergo seismic shaking associated with earthquakes on fault zones to the east and west margins of the Sierra Nevada range, as has occurred in the past. These fault zones include the Foothills Fault Zone, the volcanically active area in the Mono Craters–Long Valley Caldera area, and along the various faults within the Owens Valley Fault Zone (CDMG 1996).

Rockfalls

Rockfall is a generic term that refers to all slope movement processes, including rockfall, rockslide, debris slide, debris flow, debris slump, and earth slump. Rocks have become dislodged and fallen off the sheer granite cliffs throughout the geologic history of Yosemite. Rockfalls can displace large volumes of rock and can occur due to such processes as the climate-related expansion and contraction of rock, seismic shaking, or exfoliation. Most rockfalls are triggered by events such as earthquakes, rainstorms, or periods of warming that produce a rapid melting of snow. The magnitude and proximity of the earthquake, intensity and duration of the rainfall, the thickness of the snow-pack, and the pattern of warming all influence the triggering of rockfalls.

However, some rockfalls occur without a direct correlation to an obvious event and are probably associated with gradual stress release and exfoliation of the granitic rocks (USGS 1998).

Significant incision of the river has created the present-day relief of the gorge and a change in gradient of over 2,000 feet in roughly seven miles between Pohono Bridge (upstream of the dam) and the park boundary (downstream of the dam). The gorge area has experienced more rockfall incidences than any place in the park. Several of these have occurred along El Portal Road. The high incidence of rockfalls is partly due to the steep, narrow configuration of the gorge, riverbank undercutting, and historic human activity such as the construction of El Portal Road. These events have been well documented (USGS 1992b) and provide information regarding historic rockslide hazards along the Merced River gorge and in areas where unstable rock slopes are known to pose a risk of future rockfall events. The frequency and magnitude of rockfall events vary considerably. Many small rockfalls may occur every year and go unnoticed, while larger rockfalls occur much less frequently (USGS 1998). The National Park Service is revising its management policies regarding geologic hazards, with the intent to better protect park visitors and staff by avoiding placement of structures in areas with a high potential for rockfall impact.

Soils

The soils in relatively flat topographic positions near the Cascades Diversion Dam form from glacial and alluvial sediment deposition processes originating in Yosemite Valley, or by alluvial and colluvial deposition occurring locally within the gorge or near El Portal. Soils that formed in old river channels consist of alluvial boulders, cobbles, river wash, and loamy sands. These soils have, for the most part, moderate to severe development limitations and thus require the implementation of engineering and mitigation measures.

Hydrology, Floodplains, and Water Quality

Merced River Gorge and El Portal Watershed

Cascades Diversion Dam is located on the Merced River at the point of transition from the flat-bottomed Yosemite Valley to the glaciated V-shaped river to the gorge. The Merced River gorge begins below the dam and continues downstream to the western park boundary at El Portal. Within this area, the Merced River has a much steeper gradient than in Yosemite Valley and consists mostly of continuous rapids. As the river exits Yosemite Valley, it cascades at an average gradient of approximately 70 feet per mile through the narrow, steep-sided Merced River gorge. The riverbed and banks are largely composed of boulders and cobbles, ranging in size from a few inches to several yards in diameter.

The steeper river gradient in this area prevents the river from meandering as extensively as in Yosemite Valley. Additionally, riverbank areas in many locations have been developed and hardened for road and facility protection. Because of the steep gradient and development, the shifting of the river channel in El Portal usually occurs only during periods of large floods.

The Pohono Bridge gauging station is approximately one mile upstream of Cascades Diversion Dam, and therefore flows at the gauge are generally considered representative of flows at the dam. Historic flow measurements at the Pohono Bridge gauging station have ranged from a high of about 25,000 cubic feet per second to a low of less than 10 cubic feet per second. The mean average daily flows are highest in May and June (approximately 2,000 cubic feet per second) and

lowest during the months of September and October (less than 100 cubic feet per second) (USBR 2001). Data on flow through the gorge between Cascades Diversion Dam and El Portal are not available because there are no stream measurement stations downstream of the Pohono Bridge gauging station.

The reach of the Merced River between the Cascades Diversion Dam and Powerhouse, about 6,000 feet downstream, descends at a gradient of approximately 0.06 feet per foot and then levels to a gradient of about 0.009 feet per foot at the Cascades Picnic Area. The depositional regime of the river changes significantly as the river gradient is reduced. In the steeper reaches just downstream of the dam, the river bed is composed of large boulders; in the flatter reaches, where the reduced flow gives finer material an opportunity to settle out, the streambed is composed of cobbles, sand, and silts. The majority of the fine-grained material the river carries past Cascades Diversion Dam is deposited in the flatter, lower-energy river conditions that currently exist near the Cascades Picnic Area.

Upstream of the dam, the river gradient is approximately 0.01 feet per foot. Suspended sediments and bedload discharging from Yosemite Valley have accumulated behind the dam since it was constructed. Sediment buildup has limited the volume of impounded water to approximately 40 acre-feet, with backwater extending approximately 550 feet upstream from the dam (USBR 1983). The backwater pool ranges in width from 80 to 240 feet (USGS 1988).

To facilitate the generation of hydroelectric power, Cascades Diversion Dam was designed to channel riverflows primarily through the penstock. The intake for the former penstock is located in the river-right abutment and has a maximum capacity of 115 cubic feet per second. The majority of riverflows in excess of the penstock intake capacity flow over the crest of the dam, although the dam is designed to allow for underflow. A very small portion of riverflow therefore travels beneath the dam, and seepage is estimated to be between 5 to 15 cubic feet per second (USBR 1983).

Precipitation

The overall climate is temperate, with hot, dry summers and cold, wet winters. Approximately 85% of the precipitation falls between November and April. December, January, and February have the highest average precipitation, with a monthly average of 6 inches in Yosemite Valley at 4,000 feet. Average precipitation in Yosemite Valley is 36.5 inches, while annual rainfall decreases to 25 inches in El Portal at 2,000 feet. Snowmelt drives the peak streamflows that occur in May and June, and minimum riverflow is observed in September and October.

Alluvial Processes

Yosemite National Park is composed of and underlain by various granite rock types, and weathering, erosion, and transport of sediment can be a very slow process. In areas of Yosemite National Park, clays, silts, and organic debris have accumulated with the gravels and sands of the decomposed bedrock. These soils are subject to erosion and alluvial processes. The construction of Cascades Diversion Dam in 1917 caused a change in sediment transport dynamics along the Merced River. The dam created a condition in which sediment that normally moved through the river system would settle and become trapped. In addition, historic photographs indicate that a rock and sediment island was already present immediately upstream of what is now the Cascades Diversion Dam (Kennedy/Jenks Consultants 2002). The amount of sediment and other materials

present prior to dam construction is not known. It is estimated that 4,450 cubic yards of sediment were deposited behind Cascades Diversion Dam in the 10 years after its construction (NPS 1991), and that approximately 1,400 cubic yards of sediment were deposited between 1931 to 2002 (Kennedy/Jenks Consultants 2002). The amount of sediment deposited between 1927 and 1931 is not known. Sedimentation buildup led the National Park Service to dredge the dam in 1938, lowering the sediment bed to 2.5 feet below the dam crest. The volume of impounded sediments is currently estimated to be between 15,000 and 20,000 cubic yards (Kennedy/Jenks/Chilton and ROMA Design Group 1988), including material present before dam construction and material built up behind the dam following construction.

Floodplains

A floodplain plays a necessary role in the overall adjustment of a river system. It exerts an influence on the hydrology of the basin and also serves as a temporary storage for sediment eroded from the watershed. Periodic flooding provides sediment and nutrients that are essential for the aquatic and vegetative health of the floodplain. Floodplains are features that are both the products of the river environment and important functional parts of the system. However, human-made structures placed within a floodplain, such as Cascades Diversion Dam, can impede or alter natural flow.

From Cascades Diversion Dam downstream through El Portal, the Merced River is steep and confined in a narrow gorge. In this area, the floodplain is quite narrow and the flow velocities are very high. The river channel in El Portal can shift during large floods, including movement of large boulders that define the channel. Within this area, El Portal Road has altered the floodplain by providing a barrier to channel migration. During extreme events, the Merced River has shown the capacity to undermine or spill over and damage the roadway. Discussion of flooding and floodplains is most relevant in terms of the potential loss of life and the influence of development in the floodplain.

Water Quality

Water quality throughout Yosemite National Park is considered to be good and generally above state and federal standards. The surface water quality of most park waters is considered beneficial by the State of California for wildlife habitat, freshwater habitat, contact and noncontact recreation, canoeing, and rafting, as indicated in the Central Valley Regional Water Quality Control Board's Water Quality Control Plan (Basin Plan). An inventory of water quality data prepared by the National Park Service indicated excellent conditions in many parts of the park, but some water quality degradation was noted in areas of high visitor use (NPS 1994b).

Occasional concentrations above drinking water and freshwater criteria have been noted within the Merced River for lead, cadmium, and mercury (NPS 1994b). Potential sources of these metals include leaded gasoline, wastewater discharge, campsites, fuel storage facilities, and stormwater runoff from developed surfaces such as parking lots.

Water quality has been affected by the extensive and concentrated visitor use of the Merced River in popular areas. High use of the streambank induces bank erosion through the loss of vegetative cover and soil compaction. Bank erosion can result in the widening of the river channel and loss of riparian and meadow floodplain areas. Water quality is thus affected through increased suspended sediments, higher water temperatures from a lack of riparian cover, and lower

dissolved oxygen levels due to these elevated temperatures and to shallower river depths. Turbidity, a measure fine suspended sediments, was collected from sampling points near Cascades Diversion Dam in 2002 and 2003, as shown on table III-1.

Table III-1
Turbidity

Measurement Location[a]	Nephelometric Turbidity Units				
	Sample Date				
	9/16/02	10/09/02	11/14/02	12/10/02	1/15/03
Pohono Bridge	0.50	0.53	0.97	0.29	0.26
Below Cascades Diversion Dam	0.31	0.43	0.55	0.31	0.24
Powerhouse	0.18	0.25	0.46	0.35	0.24
Foresta Bridge	0.14	0.19	0.42	0.17	0.30

[a] Sampling locations are identified on figure II-1.

SOURCE: NPS 2002; 2003c

Human activities and the use of vehicles can distribute water pollutants that may collect on land surfaces and later be transported into the river or its tributaries by stormwater runoff. These pollutant sources are referred to as nonpoint sources because they accumulate from various areas and not from a single point source. Construction activities that disturb soil, generate dust, and cause occasional petroleum releases from equipment and vehicles can represent a short-term nonpoint pollution source. Recreational activities such as horseback riding, swimming, and hiking can lead to the introduction of organic, physical, and chemical pollutants into aquatic systems. Nonpoint-source runoff from roads and parking lots may potentially affect water quality by introducing organic chemicals and heavy metals.

Wetlands

Wetland data presented in this section are intended to provide general descriptions of wetland and water-dependent communities in the Cascades Diversion Dam project area. Refer to the Vegetation section for descriptions of vegetation, the Wildlife section for data relating to wildlife and aquatic species, and the Special-Status Species section for information on protected species of plants and wildlife. Refer to Appendix C, Wetland Statement of Findings for the Cascades Diversion Dam Removal Project.

Wetland Classification and Definition

Wetlands are transitional areas between terrestrial and aquatic ecosystems, where water is usually at or near the surface or the land is covered by shallow water. Wetlands have many distinguishing features, the most notable of which are unique soils, saturated for at least part of the year, and vegetation adapted to or tolerant of saturated soils. Wetlands are considered highly valued resources because they perform a variety of hydrological and ecological functions vital to ecosystem integrity.

The Cowardin system is used as the basis for wetland classification and protection by the National Park Service. The Cowardin system classifies wetlands based on the type of vegetative cover and lifeform, flooding regime, and substrate material. Jurisdictional wetlands are delineated and classified to meet regulations of Section 404 of the Clean Water Act. Cowardin wetlands include jurisdictional wetlands, but may also include certain nonvegetated sites lacking soil, if they meet specific criteria.

Wetlands in the Cascades Diversion Dam Project Area

Wetlands within the Cascades Diversion Dam project area are broadly classified as riparian in nature and include aquatic, riparian, and floodplain communities. The riparian zone is the plant community adjacent to a river or stream channel and serves as the interface between the river and the surrounding floodplain and upland communities. Riparian areas are characterized by the combination of high species diversity, high species density, and high productivity. Riparian plant communities are discussed in the Vegetation section, below.

Specific wetland classes identified within the project area are limited to riverine (rivers, creeks, and streams) and palustrine (shallow ponds, marshes, swamps, and sloughs). Using the Cowardin classification, specific wetland and deepwater classes within the project area include:

- *Riverine upper perennial* – main channel of the Merced River
- *Palustrine forest* – riparian forest habitat along the Merced River subject to various flooding regimes
- *Palustrine scrub shrub* – riparian scrub (e.g., willow) habitat along the Merced River subject to various flooding regimes

The following discussion provides general descriptions for each wetland class identified in the vicinity of the Cascades Diversion Dam.

Riverine Upper Perennial

Riverine upper perennial habitat within the project area includes the open and flowing water of the Merced River as well as the permanently flooded rock-, cobble-, or sand-bottom channel with little to no in-stream vegetation. Upstream of Cascades Diversion Dam, occasional sandbars form within and at the channel edge and typically support willows and emergent vegetation (grasses and herbs). Based on the National Park Service guidelines, the majority of the Merced River would be classified as wetland. Channel portions that lie at a depth of 2 meters below low water would be considered deepwater. The main channel of the Merced River would likely be considered nonwetland by the U.S. Army Corps of Engineers; however, it would be subject to jurisdiction under Section 404 of the Clean Water Act as nonwetland waters of the United States.

Palustrine Forest

Palustrine forests are the riparian forest habitats along the Merced River that are regularly inundated by normal high-water or flood flows. In the project area, deciduous cottonwoods, willows, and alders dominate the riparian corridor. Substrate under the palustrine forest community varies from rock, gravel, and sand to clays, loams, and mud. Palustrine forests (riparian forests) are classified as wetlands based on the National Park Service guidelines (USFWS 1995). These areas are classified as either wetland or nonwetland waters of the United States by the U.S. Army Corps of Engineers, depending on site-specific vegetation, soils, and hydrologic conditions.

Palustrine Scrub Shrub

This habitat type occurs sporadically along the banks of the main stem of the Merced River. It is regularly inundated by normal high-water or flood flows. This habitat is dominated by various willows and often intergrades with meadow (palustrine emergent) and riparian (palustrine forest) communities. These communities are typically classified as wetlands under both the National Park Service (USFWS 1979) and U.S. Army Corps of Engineers classification systems.

Cascades Diversion Dam Wetland and Aquatic Habitats

The following narrative describes wetland and water-associated communities along the Merced River from Pohono Bridge (upstream of the dam) to El Portal (downstream of the dam). Within this area, the Merced River transitions at the dam from the flat, U-shaped valley to the steep, V-shaped gorge. Through the gorge, the river has a much steeper gradient compared to Yosemite Valley and consists mostly of continuous rapids to El Portal. The riverbed and banks are largely composed of boulders and cobbles, ranging in size from a few inches to several feet in diameter.

The floodplain upstream of the dam is slightly wider and characterized by varied topography; hummocks and depressions create diverse habitats, which in turn yield greater plant species diversity. Adjacent to the water, a mixture of sedges and rushes are found in the wettest sites. Willow species are all present in the near-bank area of the floodplain. Recently germinated willow and cottonwood seedlings, herbaceous species, a variety of grass species, and other vegetation are found in the floodplain upstream of the dam. See the Vegetation section below for more information.

The floodplain within the dam and impoundment area is almost entirely located on the river-left side of the Merced River. The river-right side of the river has a narrow, steep riparian area constricted by El Portal Road, with only a narrow band suitable for supporting wetland plant species. The floodplain on the river-left bank is somewhat restricted due to the impoundment area and shading from steep, north-facing cliffs. Willow species, cottonwood, alder, herbaceous species, and other vegetation are found in the project area. See the Vegetation section, below, for more information. Approximately 30% of the floodplain within the impoundment area upstream from the dam is bare soil, likely a result of deposition from the flood of January 1997.

The Merced River gorge downstream of the dam is steep, with a narrow floodplain band of riparian vegetation along the river course. Riparian species in this area are generally characterized by isolated pockets of willow, white alder, and oaks. See the Vegetation section below for more information.

Vegetation

The following narrative provides a general description of vegetation in the Cascades Diversion Dam project area. Vegetation within the area can be loosely defined as riparian and upland. Actual descriptions of vegetative communities, including distributional limits, habitat requirements, community sensitivities, and a list of plant species characteristically found within each community, appear in the *Vegetation Management Plan* (incorporated by reference) (NPS 1997f).

Riparian Plant Communities

Riparian zones extend outward from bank edges of the Merced River into adjacent forest communities. Riparian ecosystems play a critical role in a variety of ecological processes. Situated at the interface between terrestrial and aquatic ecosystems, the riparian zone acts to buffer hydrologic and erosional cycles, control and regulate biogeochemical cycles of nitrogen and other key nutrients, limit fire movements, and create unique microclimates for animal species (Rundel and Stuner 1998).

Riparian zones upstream of the dam and at the dam and impoundment are characterized by broadleaf deciduous trees such as white alder, black cottonwood, and willow species. Riparian vegetation is regularly disturbed by the deposition and removal of soil and the force of floodwaters. Plants in this zone readily colonize newly formed river-edge deposits. The distribution of riparian communities varies with soil saturation and frequency of disturbance. For example, big-leaf maple riparian forests grow on moist, gravelly soils in protected spots on alluvial soils bordering streams, whereas sandbar willow woodlands occur on point and mid-channel bars that are washed over annually by spring floods (Acree 1994).

The floodplain upstream of the impoundment includes a mixture of small-fruited bulrush, sedge, beaked sedge, and a variety of rush species in the wettest sites adjacent to the water. Sandbar willow, red willow, and arroyo willow are all present in the near-bank area of the floodplain. Low pockets are densely populated with recently germinated willow and cottonwood seedlings, probably resulting from the January 1997 flood. Bare soil is being colonized by horsetail, dogbane, and goldenrod. A variety of grass species, including hairgrass, reed grass, and brome, occur throughout the floodplain. Inflated sedge is concentrated between 1 and 5 feet above the water level. White alder is sparse and corresponds roughly with the bankfull mark.

The dominant willow species in the dam and impoundment area is red willow, with sandbar willow and arroyo willow intermixed. Black cottonwood and white alder are minor components. Herbaceous species include small-fruited bulrush, various species of sedge and rush, horsetail, dogbane, and goldenrod. As noted above under Cascades Diversion Dam Wetland and Aquatic Habitats, approximately 30% of the floodplain in the impoundment area is bare soil.

The Merced River gorge downstream of the dam is steep, with a narrow floodplain band of riparian vegetation along the river course. The riparian zone, especially to the river-left, remains largely untouched by human intrusion (with the exception of the El Portal Road corridor and development in El Portal). Riparian species in this area are generally characterized by isolated pockets of willow, white alder, and oaks. Native ash trees occur in the wetter areas, as do historic orchard components in some locations. Foothill pines and valley oaks tend to dominate the drier terraces adjacent to riparian sites, with a lower proportion of mature oaks than in the oak communities due to higher moisture levels and shallower soils caused by past flood scouring.

Upland Plant Communities

Five upland forest types are found in the vicinity of the project area. Mixed coniferous forest is found on the floor of the Valley. Canyon live oak forest, north-facing mixed conifer/canyon live oak talus forest, and south-facing mixed conifer/canyon live oak forest occur on the talus slopes above the Merced River. The chaparral/oak woodland zone occurs throughout the gorge.

Canyon live oak communities grow on both north- and south-facing talus slopes and often form pure or almost pure stands. This community is common on the steep canyon walls along El Portal Road. A small stand of shrub and tree variety tanbark oak is located adjacent to the river-left dam abutment. This is the only stand of the tree variety of tanbark oak and one of two known stands of the shrub variety of tanbark oak in Yosemite National Park. Fires in the canyon live oak community are infrequent but intense, with a fire return interval of 20 to 50 years on south-facing slopes. Most trees and shrubs in this community crownsprout after fire.

Mixed conifer communities are normally dominated by ponderosa pine and generally grow at elevations of 3,000 to 5,000 feet. This habitat also contains incense-cedar, sugar pine, and occasional California black oaks. The most common understory shrubs are Mariposa manzanita, deerbrush, and bear-clover. This species intergrades with the narrow riparian band on the river-left side of the Merced River above the dam and impoundment.

The mixed conifer community is naturally adapted to low-intensity, frequent fires. Nearly 100 years of fire suppression has resulted in a change from open forest to dense thickets of shade-tolerant tree species, including incense-cedar, white fir, and Douglas-fir. Under natural conditions, the return interval for fire is estimated at eight to 12 years (NPS 1990). Present conditions, however, often generate fires of much greater intensity than under a natural fire regime.

The Merced River gorge is in the mixed conifer and chaparral/oak woodland zone (Sawyer and Keeler-Wolf 1995). It is lined with a narrow band of riparian vegetation along the river course and bordered by a dense mosaic of chaparral and foothill woodland communities on the steep canyon walls. Vegetation communities include blue oak woodland, interior live oak woodland, foothill pine/oak woodland, interior live oak/chaparral, and riparian woodland.

Non-native, or introduced, plant species have become established in the upland forest zones, although not to the extent they have in meadows and California black oak communities. These species are the result of either deliberate or accidental introductions and are not part of the naturally evolved community. Many of these species are indicators of past agricultural activities that occurred throughout the area. Approximately 180 non-native species have been identified in the park, primarily in the chaparral/oak and mid-elevation forests (Fritzke and Moore 1998). Non-native species are generally herbaceous and associated with ground disturbance (one-time or reoccurring). Typical species include European annual grasses and bull thistle.

All of the communities in this area are adapted to frequent natural fires sparked by lightning. Fire suppression has led to increased vegetative density, especially on north-facing slopes where recent fires have been successfully suppressed.

Wildlife

Yosemite National Park, one of the largest and least-fragmented habitat blocks in the Sierra Nevada, supports a diverse and abundant assemblage of wildlife. Its importance in protecting the long-term survival of certain species and the overall biodiversity[1] of wildlife in the Sierra Nevada

[1] Biodiversity, or biological diversity, is generally accepted to include genetic diversity within species, species diversity, and a full range of biological community types. The concept is that a landscape is healthy when it includes stable populations of native species that are well distributed across the landscape.

was recognized in the reports prepared as part of the Sierra Nevada Ecosystem Project (UC Davis 1996a,b,c,d).

The Merced River corridor also plays an essential ecological role in linking wildlife habitats across the park's landscape and elevational gradients; this fact forms an important part of the framework for this analysis. For wildlife populations to be viable, resources and environmental conditions must be sufficient for foraging, resting, cover, and dispersal of animals. Arrangement, types, and amounts of resources must be sufficient for the needs of reproductive individuals on daily, seasonal, and yearly scales. Habitat must also be well distributed over a broad geographic area to allow breeding individuals to interact spatially within and among populations, and a stable, relatively undisturbed riparian corridor supplies a mechanism for this kind of ecological connection.

Wildlife of Cascades Diversion Dam and Merced River Gorge

Montane hardwood conifer (mixed conifer) is the predominant upland habitat type adjacent to riparian areas at the elevation of Yosemite Valley and below. This type is broadly transitional from the higher, largely coniferous stands and both surrounds and gives way to montane chaparral at its downhill edge. As such, its wildlife community includes species common to higher and lower elevations, leading to high species diversity.

Wildlife Resources

The area encompassing the project area and Merced River gorge is lined with a narrow band of riparian vegetation along the river course, bordered by a dense mosaic of chaparral and foothill woodland communities (chaparral/oak woodland zone) on the steep canyon walls. Birds commonly found in this zone include stellar's jay, Cooper's hawk, western screech owl, white-headed woodpecker, mountain chickadee, winter wren, and dark-eyed junco. While the U.S. Fish and Wildlife Service lists the American dipper as a species of local or regional concern, this species is common within the park and is considered a general wildlife species within this environmental assessment. Mammals include deer mouse, bushy-tailed woodrat, spotted skunk, mule deer, ringtail, and bobcat (NPS 2003b). More significantly, the rock outcrops and associated crevices of the gorge probably harbor a high density of special-status bat species (e.g., spotted bat, California mastiff bat) (CDFG 1999). Many of these species are also present in Yosemite Valley. Bat species such as Townsend's big-eared bat and Yuma myotis occasionally use human structures and are vulnerable to impact (Pierson and Rainey 1993).

Fish Resources

The river reach between Cascades Diversion Dam and El Portal is characterized by steep gradients, large boulders strewn throughout the channel, and frequent pools and cascading waterfalls. The north side of the canyon consists of foothill pine and oak woodland vegetation. There is no floodplain in this reach. The only native fishes known to have passed through the gorge and established populations in Yosemite Valley are rainbow trout and Sacramento sucker, though the native rainbow trout strain has likely been altered by the introduction of non-native strains. The calm waters at Cascades Picnic Area provide a natural pool habitat for fish and likely support small numbers of brown and rainbow trout. Sacramento suckers are likely found throughout the gorge in small numbers. Riffle sculpin are also found in some parts of the gorge. Fishes native to the Merced River below the gorge include rainbow trout, Sacramento sucker, Sacramento pikeminnow, hardhead, California roach, and the riffle sculpin. These species are

widespread in the Central Valley waters and are not of special status or recreational value. This reach of the Merced River also supports introduced populations of smallmouth bass and brown trout; fly-fishing for these species is popular in certain areas.

Lake McClure, located 55 miles below El Portal, is heavily stocked with non-native and native species to enhance sport fishing. Species with such wide geographical distributions as Florida largemouth bass, channel catfish, and chinook salmon are found in Lake McClure. Sport fishes commonly found in the lower Merced River above Lake McClure include smallmouth bass, rainbow trout, and brown trout. Fly-fishing for these species is popular in certain areas. It is doubtful, however, that these species (except possibly rainbow trout) would move above El Portal through the Merced River gorge.

Special-Status Species

Species Considered

A total of 55 special-status wildlife species and 28 special-status plant species (83 total) have been considered in the evaluation of this project (see Appendix D, Special-Status Species Evaluation). These species were identified based on data gathered from the National Park Service, the U.S. Fish and Wildlife Service (USFWS 2002), and the California Natural Diversity Data Base. The National Park Service has determined that 71 species (out of 83 total) are not known or likely to occur in the vicinity of the project area. In addition, preferred habitat for 71 species is also not likely to occur in the vicinity of the project area. The remaining species, the Wawona riffle beetle, harlequin duck, California spotted owl, and a number of special-status bat species, are described below.

These species are further evaluated in Chapter IV, Environmental Consequences, of this environmental assessment. The remaining special-status species are described in Appendix D, Special-Status Species Evaluation. Additional data on these species are included in the Biological Assessments for the Merced River Plan and *Yosemite Valley Plan* (incorporated by reference) (NPS 2000a; 2000c; 2001a), which are on file at Yosemite National Park.

Critical Habitat

Critical habitat has not been designated for any federally listed species that is known or has potential to occur within the project area. However, critical habitat for the California red-legged frog has been designated by the U.S. Fish and Wildlife Service northwest of the project area within Yosemite National Park (Federal Register 2001).

Special-Status Wildlife

Federal Special-Status Wildlife

Wawona Rifle Beetle. This aquatic species is listed as a species of concern due to its limited distribution in the North and South Forks of the Merced River. Habitat includes rocks and mossy areas within the river channel.

The Wawona riffle beetle is rare in rapid streams of California from 2,000 to 5,000 feet in elevation (Usingner 1956). The Wawona riffle beetle was previously known only from a few locations in California (Chandler 1954; Brown 1972); recently, however, it was found in several

widely scattered locations in northern California as well as southern Oregon and Idaho (Shepard and Barr 1991). Adults and larvae are found together, usually in cool, small to medium-sized mountain streams and rivers. They are most abundant in aquatic mosses and are rarely found in streams that exhibit seasonal variations in flow, heavy sediments, muddy or sandy bottoms, or low oxygen content (NPS 1997a).

Suitable habitat for the Wawona riffle beetle occurs in the Merced River through Yosemite Valley and El Portal and the South Fork of the Merced River in Wawona. It was described and named after specimens collected in the South Fork of the Merced River in Wawona. The California Academy of Sciences has records for seven specimens collected in the Merced River canyon between 1923 and 1932. These specimens were collected from 0.5 mile west of El Portal to 5.3 miles west of El Portal in rockslide areas (Roth 1972). Additional surveys have also found the beetle in the Merced River (Arnold 2001; USGS 1999).

Surveys were conducted in the fall of 2002 for the Wawona riffle beetle along an approximately 3.5-mile stretch of the Merced River from Pohono Bridge to the Cascades Picnic Area. Suitable habitat was observed throughout the study area; however, no life-stage of the beetle was found. Suitable habitat included areas of aquatic mosses with a prevalence of partially submerged and submerged boulders, and where the river channel was at least partially shaded by trees growing along the shoreline. In more open, sunlit stretches of the river channels, such as at beaches and adjacent to meadows, mosses were occasionally observed on boulders where some shading was usually evident, but not in the more exposed areas. Due to the low water level at the time of the survey, aquatic mosses that would normally be submerged were exposed. While the species was not observed during the survey, it is anticipated that it would be observed in this area during periods of higher water levels, based on the presence of suitable habitat and previous observations of the beetle (ESA 2002).

Harlequin Duck. California is the extreme southern extent of the range of this species. Harlequin ducks winter in marine waters along rocky coasts from San Luis Obispo County north, and breed inland along fast-flowing, shallow rivers and streams. Both wintering and breeding populations of the harlequin duck have declined all over California, probably due to human disturbance along breeding streams and the damming of rivers. It is likely harlequin ducks still breed in California, but rarely. Nests are established near swift rivers or streams in recesses sheltered overhead by stream banks, rocks, woody debris, or low shrubs. Nests are usually within 7 feet of the water, but can be up to 90 feet away. In breeding areas, harlequin ducks feed primarily on invertebrates; in marine wintering habitat, mollusks and crustaceans are major foods.

The last sighting of transients in Yosemite National Park occurred near Table Rock just upstream from Cascades Diversion Dam in the spring of 2000. Nest observation occurred upstream of Cascades Diversion Dam in 2002 (NPS 2003b).

California Spotted Owl. This species is found from the southern Cascades south through the entire Sierra Nevada and in the central Coast Ranges. Surveys through 1993 estimated approximately 1,600 spotted owl sites (pairs and territorial singles) in the Sierra Nevada. California spotted owl habitat varies from oak and ponderosa pine forests to lower elevation red fir forests up to 7,600 feet in elevation. Prime habitat occurs between 3,000 and 7,000 feet.

Breeding occurs from about mid-February to mid- or late September, at which time the young are largely independent of their parents. Eggs are laid and incubated by the female from early April through mid-May. Nests are usually tree cavities, broken-off trees and snags, abandoned nests of other species, or mistletoe clumps. Trees used for nesting are usually very large. Nesting and roosting habitat of spotted owls is typically dense forest, with a canopy closure of greater than 70%. The presence of black oak in the canopy also enhances habitat quality.

Surveys and inventories to determine the distribution and abundance of spotted owls in the park were conducted from April through August of 1988 and 1989 by the California Department of Fish and Game. Surveys covered 142,700 acres of forest habitat at elevations between 3,000 and 7,000 feet. These elevations form a narrow band on the west slope of the Sierra Nevada. Owls were seen or responded to imitated spotted owl calls at 58 sites over the two seasons. U.S. Forest Service protocol was used to establish pair occupancy. Reproductive activity was observed serendipitously. Two nest trees and four sites with young were observed in 1989. Combined crude densities were estimated to be 0.18 owls/square kilometer. Based on the Gould and Norton study, the known or "occupied" habitat for the spotted owl in the park totals about 142,000 acres. In Yosemite Valley, National Park Service wildlife staff has confirmed spotted owl sightings near Happy Isles, Mirror Lake, the Chapel, and the base of Cathedral Rocks. No nesting owls occur within the project area, though suitable habitat is present (NPS 1999; 2003b).

Spotted Bat. This species is found in western North America, from British Columbia into Mexico. It lives in desert scrub and open forest areas and roosts in cliff faces and rock crevices. The species forages in a wide variety of habitats, primarily for moths. There is a significant population of spotted bats in Yosemite Valley (Pierson and Rainey 1995). Auditory bat surveys were conducted in 1993 at 24 stations in Yosemite Valley in four habitats: large open meadows, wetlands, forest, and open ponderosa pine forest. Acoustic surveys detected the spotted bat in meadow and wetland habitats only (Pierson and Rainey 1993). The spotted bat forages on the north side of El Capitan Meadow, just below El Capitan, Bridalveil Meadow, Leidig Meadow, and the Ahwahnee Meadow (Pierson and Rainey 1993). The species was not found in Cook's Meadow or Stoneman Meadow. A study of potential bridge roosting sites along State Route 120 found no evidence of spotted bats at any of the six sites within the park (Pierson et al. 2001).

It is likely that the spotted bat roosts on or near Half Dome and El Capitan (Pierson and Rainey 1993). Yosemite Valley had the highest population of spotted bats of any localities surveyed in California (Pierson and Rainey 1995). Acoustic data collected in 1994 suggest there is a significant population of spotted bats in the Wawona area (Pierson and Rainey 1993; 1995).

Long-Eared Myotis Bat. This species is found across much of western North America, from British Columbia south to California and New Mexico. The species is found in a wide range, from the coast to the high Sierra Nevada, and in montane oak woodlands. The species lives in coniferous forests in mountain areas and roosts in small colonies in caves, buildings, under tree bark. Mist-net bat surveys were conducted in Yosemite Valley from 1993 to 1996 at Mirror Lake, Cook's Meadow, El Capitan Meadow, Cathedral and Cascades Picnic Areas, and at Yosemite Creek below Yosemite Fall. The long-eared myotis bat was captured at the Cathedral and Cascades Picnic Areas and at the Yosemite Creek site (Pierson and Rainey 1993; Pierson et al. 2001). It was also captured in Wawona.

Fringed Myotis Bat. This species is found in much of California, up to British Columbia, and is scattered across several southwestern states and into Mexico. It is found to at least 6,400 feet in the Sierra Nevada, in deciduous/mixed conifer forests. This species feeds over water, in open habitats, and by gleaning from foliage; it roosts in caves, mines, buildings, and trees, especially large conifer snags. Grinnell and Storer found the fringed myotis bat in 1924 in a location just outside the park boundary. Mist-net bat surveys were conducted in Yosemite Valley in 1993 at Mirror Lake, Cook's Meadow, El Capitan Meadow, and at Yosemite Creek below Yosemite Fall (Pierson and Rainey 1993; 1995). The fringed myotis bat was captured in Cook's Meadow and the Yosemite Creek site (Pierson and Rainey 1993). It was not found in mist-netting surveys in 1994 in Yosemite Valley (Pierson and Rainey 1995). Mist-net surveys conducted in 1996 did find the fringed myotis bat in El Capitan Meadow and at the Cascades Picnic Area (Pierson et al. 2001). Suitable habitat also occurs throughout the Merced River gorge.

Long-Legged Myotis Bat. The range of this species includes most of western North America, as far north as Alaska and south to central Mexico. The species prefers forested mountainous areas and is sometimes found in desert lowlands. The species is found up to high elevations in the Sierra Nevada, in montane coniferous forest habitats. The long-legged myotis bat forages over water, close to trees and cliffs, and in openings in forests; it roosts primarily in large-diameter snags. The species forms nursery colonies numbering hundreds of individuals, usually under bark or in hollow trees. The long-legged myotis bat was recently recorded in the park (Pierson et al. 2001), which was the first siting since it was found in the Grinell and Storer survey (1924). These sightings were recorded at Cascades Creek and Yosemite Creek. In addition, there have been several sightings throughout Yosemite Valley. Suitable habitat also occurs throughout the Merced River gorge, upper Merced River, and along portions of the South Fork.

Yuma Myotis Bat. This species is found across much of the western United States and into western Canada, usually below 8,000 feet in elevation. The species forages over open, still, or slow-moving water and above low vegetation in meadows. The Yuma myotis bat roosts in buildings, caves, or crevices; nursery colonies choose caves, mines, buildings, or under bridges. The species skims low over water to snatch up flying insects. Mist-net bat surveys were conducted in Yosemite Valley in 1993 at Mirror Lake, Cook's Meadow, El Capitan Meadow, Yosemite Creek below Yosemite Fall, Cathedral Picnic Area, and Cascades Picnic Area (Pierson and Rainey 1993; 1995; Pierson et al. 2001). The Yuma myotis bat was captured at Mirror Lake, El Capitan Meadow, the Yosemite Creek site, and both the Cathedral and Cascades Picnic Areas. This species was also found in recent mist-netting surveys in Yosemite Valley and Wawona (Pierson and Rainey 1993; 1995), and in hand-net or visual surveys at bridge crossings at Cascades and Wildcat Creeks (Pierson et al. 2001). There have also been several sightings throughout Yosemite Valley. Suitable habitat also occurs throughout the Merced River gorge, upper Merced River, and along portions of the South Fork.

Greater Western Mastiff Bat. The range of this species includes southern California and Arizona, extending into Mexico. The species is found in a variety of habitats to over 8,000 feet in elevation. The species roosts primarily in crevices in cliff faces and occasionally in trees and buildings; it is detected most often over meadows and other open areas, but will also feed above forest canopy, sometimes to high altitudes (1,000 feet). There is a significant population of greater western mastiff bats in Yosemite Valley, as determined by mist-netting surveys (Pierson and Rainey 1995; Pierson et al. 2001). Auditory bat surveys were conducted in 1993 at 24 stations in Yosemite Valley in four habitats: large open meadows, wetlands, forest, and open ponderosa pine forest.

Acoustic surveys detected the greater western mastiff bat in Bridalveil Meadow, El Capitan Meadow, Leidig Meadow, Cook's Meadow, Ahwahnee Meadow, Stoneman Meadow, Wosky Pond, Mirror Lake, and wetlands near Happy Isles. It was also detected in a few upland habitats east of El Capitan Meadow and Sentinel Beach Picnic Area. Recent mist-netting surveys found the greater western mastiff bat in the Cascades Picnic Area (Pierson et al. 2001). Yosemite Valley has the highest population of the greater western mastiff bat of any locality surveyed in California (Pierson and Rainey 1995). It also has been captured in Wawona (Pierson and Rainey 1995). Suitable habitat also occurs throughout the Merced River gorge, upper Merced River, and along portions of the South Fork.

Pale Big-Eared Bat. This species is found in all habitats up to the alpine zone. It requires caves, mines, or buildings for roosting and prefers mesic habitats, where it gleans from brush or trees along habitat edges. The species has been recorded at Wildcat Creek Bridge and Mirror Lake (CDFG 1999), and there have been several sightings throughout Yosemite Valley.

Townsend's Big-Eared Bat. In California, the Townsend's big-eared bat is found from low desert to mid-elevation montane habitats. The majority of records are from low to moderate elevations, though the Townsend's big-eared bat has been found from sea level to almost 10,000 feet in elevation. Maternity colonies have been found up to over 5,000 feet in elevation in the Sierra Nevada. The Townsend's big-eared bat is concentrated in areas with mines (particularly in the desert regions to the east and southeast of the Sierra Nevada) or caves (in the northeast portion of California and karstic regions in the Sierra Nevada and Trinity Alps) as roosting habitat (Pierson and Fellers 1998). In 1994, mist-net bat surveys were conducted in Tuolumne Meadows, Pate Valley, and Wawona. The Townsend's big-eared bat was captured in Wawona (Pierson and Rainey 1993; 1995). It was also captured in Yosemite Valley in 1993 and 1996 (Pierson and Rainey 1993; 1995; Pierson et al. 2001).

State-Listed Special-Status Species

Pallid Bat. The pallid bat is found throughout California, primarily in the low to mid-elevations, although it has been found to elevations over 10,000 feet in the Sierra Nevada. It is found in a variety of habitats, from desert to coniferous forest and nonconiferous woodlands. It is particularly associated with ponderosa pine, redwood, and giant sequoia habitats. It selects a variety of day roosts, including rock outcrops, mines, caves, hollow trees, buildings, and bridges. Recent research suggests a high reliance on tree roosts. It commonly uses bridges for night roosts (Pierson et al. 2001). Between 1994 and 1998, mist-net bat surveys were conducted in Tuolumne Meadows, Cascades Picnic Area, Mirror Lake, Pate Valley, and Wawona. The pallid bat was captured in Pate Valley at Mirror Lake, the Cascades Picnic Area, and Wawona (Pierson and Rainey 1993; 1995; Pierson et al. 2001). It was also captured in Yosemite Valley in 1993 (Pierson and Rainey 1993; 1995).

Special-Status Vegetation

A total of 28 plant species that have special federal, state, or park status have been evaluated herein (see Appendix D, Special-Status Species Evaluation). Six plants are classified as federal species of concern (or federal species of local concern), one of which is also listed by the park as rare; three are listed as rare or threatened by the State of California; and the remaining 19 are listed by the park as rare. None of the plant species evaluated have been located within the project area.

Air Quality

Yosemite National Park is classified as a mandatory Class I area under the federal Clean Air Act (42 United States Code 7401 et seq.) (see Appendix A, Regulations and Policies). This air quality classification is aimed at protecting parks and wilderness areas from air quality degradation. The act gives federal land managers the responsibility for protecting air quality and related values from adverse air pollution impacts, including visibility, plants, animals, soils, water quality, cultural and historic structures and objects, and visitor health.

The project area is in Mariposa County, which is regulated by the Mariposa County Air Pollution Control District. Mariposa County Air Pollution Control District is responsible for developing a state implementation plan for federal and state nonattainment pollutants in its jurisdiction. State implementation plans define control measures that are designed to bring areas into attainment. Mariposa County is currently in attainment or is unclassified for all national ambient air quality standards. However, Mariposa exceeds two California ambient standards: ozone throughout the county and particulate matter less than 10 microns in diameter (PM10) in Yosemite Valley. Basic components of a state implementation plan include legal authority, an emissions inventory, an air quality monitoring network, control strategy demonstration modeling, rules and emission limiting regulations, new source review provisions, enforcement and surveillance, and other programs as necessary to attain ambient air quality standards.

Sensitive Receptors

Land uses such as recreation areas, campgrounds, schools, child-care centers, hospitals, and convalescent homes are considered to be more sensitive than the general public to poor air quality because the population groups associated with these uses have increased susceptibility to respiratory distress. Persons engaged in strenuous work or exercise have increased sensitivity to poor air quality. Residential areas are considered more sensitive to air quality conditions compared to commercial and industrial areas because people generally spend longer periods of time at their residences. Recreational uses are also considered sensitive compared to commercial and industrial areas due to the greater exposure to ambient air associated with outdoor activities. Recreational users along the Merced River near the project area and users of the Cascades Picnic Area would be the closest sensitive receptors to the project area.

Noise

Introduction

By definition, noise is human-caused sound and is considered to be unpleasant and unwanted. Whether a sound is considered unpleasant depends on the individual listening to the sound and what the individual is doing when the sound is heard (i.e., working, playing, resting, sleeping). Natural sounds within Yosemite National Park and adjacent to the Merced River are not considered to be noise. These sounds result from natural sources such as waterfalls, flowing water, animals, and rustling tree leaves. The enjoyment of such river-related natural sounds is considered an important visitor experience. The existing noise within the park results from mechanical sources such as motor vehicles, generators, and aircraft, and from human activities such as talking and yelling.

Existing Noise Sources

Motor Vehicles

The noise environment at Cascades Diversion Dam is primarily influenced by automobiles, recreational vehicles, buses, and trucks (motor vehicles) accessing the park via El Portal Road and Big Oak Flat Road. Noise from motor vehicles is loudest immediately adjacent to El Portal Road but, due to generally low background sound levels, can be audible a long distance from the roadway. Atmospheric effects such as wind, temperature, humidity, topography, rain, fog, and snow can significantly affect the presence or absence of motor vehicle noise in various areas of the Merced River corridor. Noise levels from motor vehicles will be loudest where and when activity levels are the greatest and nearest to the area.

Aircraft

As part of a report to Congress (NPS 1994a), the National Park Service conducted a visitor survey in Yosemite National Park. Of the visitors surveyed, 55% reported hearing aircraft sometime during their visit. The report notes that recognition of noise from aircraft was highly variable from location to location, and that visitor recognition of noise was greater in areas of lower development. In Yosemite, a majority of the comments came from wilderness trail users.

Other Sources

Other mechanical sources of noise within the park and near the Merced River include roadway construction equipment, generators, radios, and park maintenance equipment (i.e., mowers and chainsaws). The frequency of use and the location of these sources vary by season.

Background Sound/Noise Levels

Current sound levels adjacent to the main stem of the Merced River vary by location and season (the volume of water in the river being lower in the fall and higher in the spring). Current noise levels are also influenced by the number of visitors to the park and by the proximity of mechanical noise sources.

Sound and noise levels are measured in units known as decibels. For the purpose of this analysis, sound and noise levels are expressed in decibels on the "A"-weighted scale, or dBA. This scale most closely approximates the response characteristics of the human ear to low-level sound. Human hearing ranges from the threshold of hearing (0 dBA) to the threshold of pain (140 dBA). Environmental sound or noise levels typically fluctuate over time, and different types of noise descriptors are used to account for this variability. One of these descriptors, Leq, is the energy-equivalent level, which is the equivalent steady-state level which, in a stated period, reflects the same acoustic energy as the actual time-varying level during the same period.

A sound-level measurement was obtained on the Cascades Diversion Dam intake structure in September 2002 using a Metrosonics dosimeter (Model 308-b). The dosimeter was calibrated with a Metrosonics sound-level calibrator. At this location, the average sound-level (Leq) over a 10-minute period was 62.6 dBA, and the maximum noise level recorded was 78.5 dBA. Motor vehicle traffic accounted for most of the noise, as the measurement was taken 30 feet from the center of the intersection of El Portal Road and Big Oak Flat Road. The water level and flow of the river was low at that time, and the sound of water flow in the river was not audible, even during periods with no traffic.

Sound levels were measured approximately 500 feet east (upstream) of the Cascades Diversion Dam in September 1999 for development of the Merced River Plan. This portion of the river is calm due to impoundment from the dam. At this location, measured sound levels were roughly 48.5 dBA, with a recorded maximum level of 63.0 dBA when a bus passed on Northside Drive. Measured sound levels indicate that the background (minimal) sound level near the project site is roughly 48.5 dBA.

Cultural Resources

Overview of Human Occupation

American Indians

The area now comprising Yosemite National Park was first inhabited by people between 4,000 and 6,000 years ago. The area surrounding the intersection of El Portal Road and Big Oak Flat Road has been used as a site of human occupation and a travel corridor over the past several thousand years. Some preliminary evidence from the El Portal area indicates that people may have been living there as long as 9,500 years ago. The park area contains hundreds of archeological sites, evincing thousands of years of occupation. There is evidence of technological change through time, a highly developed trade network, at least one population replacement, and significant environmental manipulation through the use of fire.

When Euro-Americans first entered Yosemite Valley in 1851, the Indians living there were most likely Southern Sierra Miwok; however, parties of the Mono Lake Paiute and adjacent Miwok groups would periodically enter the Valley for trade (Barett and Gifford 1933). The upland areas of the Merced River drainage were frequented by Southern Sierra Miwok, possibly Mono Lake Paiute, and at least traversed by Western Monos and possibly Chukchansi Yokuts. El Portal was inhabited by Miwok people as well.

As awareness of Yosemite Valley grew, hotels and other travel-related amenities were developed. Management of the Valley was taken over by Euro-American institutions, and American Indian interests were subject to decisions made without their influence. Labor shortages led many Paiute Indians to take up permanent residence in Yosemite Valley. Traditions changed as Indian people built nontraditional houses, vacated old village sites, and built new villages. These changes were due in part to efforts by Euro-Americans to centralize the Indian people as a tourist “attraction” and control their activities.

At least seven Indian tribes claim traditional associations with Yosemite National Park, and the National Park Service has entered into various agreements with the American Indian Council of Mariposa County, Inc., the political organization representing the Southern Sierra Miwok tribe. Individuals from most of these tribes continue to maintain cultural associations with lands and resources in Yosemite National Park through traditional ceremonies, gathering of traditional plants, and other activities.

Euro-Americans

The Euro-American history of the Merced River gorge began in the 1870s, when James Hennessey of El Portal built and maintained a trail between El Portal and Yosemite Valley through the gorge. The Coulterville and Yosemite Turnpike Company constructed the Coulterville Road, which entered the Merced River canyon just west of the Cascades area and continued east to Yosemite Valley. In 1907, after two years of construction, the Yosemite Valley Railroad Company completed the El Portal Road between the rail terminus at El Portal and Yosemite Valley. The "All Year" Highway (State Route 140) was completed in 1926 and increased accessibility into Yosemite Valley.

In the early part of the twentieth century, National Park Service Director Stephen T. Mather envisioned a "new Yosemite" where modern comforts of hot water, restaurants, and electricity could be experienced "to meet the ever-increasing demand for every type of experience." In 1917, visitation reached a total of 34,510. This increased visitation meant a greater need for providing those modern visitor comforts, which ultimately led to the 1918 completion of the Cascades Diversion Dam and Hydroelectric Powerhouse.

The Yosemite Hydroelectric Power Plant and associated structures (including the dam) (NPS ID Number 439) were constructed during 1917-1918 to provide electrical power to Yosemite Valley. Water was diverted from the Merced River into a wooden penstock that paralleled El Portal Road and dropped into the power plant, where electricity was generated. The electricity was then conducted along 11-kilovolt overhead power lines from the power plant to Yosemite Valley. The hydroelectric complex is listed in the National Register of Historic Places, significant for engineering. The hydropower system is no longer in use, and many elements of it have been removed in consultation with the State Historic Preservation Officer and Advisory Council on Historic Preservation (NPS 1986). The five adjacent Cascades residences north of El Portal Road, which are no longer in use, were constructed to provide housing for individuals responsible for maintaining and operating this system.

Archeological Resources

To date, approximately 6% of park lands have been inventoried for archeological resources, and over 1,100 archeological sites have been documented. Most of the inventories focus on lower-elevation developed areas and road corridors; however, some wilderness areas have also been surveyed. In most cases, inventories have been conducted in support of park development projects as part of the environmental and historic preservation compliance process. The most recent comprehensive overview of archeological resources and their informational value is presented in *An Archeological Synthesis and Research Design for Yosemite National Park, California* (Hull and Morrato 1999). This document summarizes the results of past archeological research and presents research questions and methodologies for furthering understanding of prehistoric and historic lifeways in the Yosemite region.

Archeological resources in the Merced River corridor include historic and prehistoric sites. The historic sites are associated with development and use of this canyon as a travel corridor and include rock quarries, dumps, the remains of two work camps, a few unidentified structural foundations, and the Coulterville Road blacksmith shop. The shop is located in the talus west of the Cascades area where a forge was built to serve travelers along this road. Four prehistoric

American Indian archeological sites are located in and adjacent to the Cascades area. These sites are likely seasonal villages and contain features such as mortar rocks, midden soil, lithic scatters, and rockshelters.

Ethnographic Resources

American Indian people continue their traditional cultural associations with park lands and resources. Other than the Yosemite Valley study by Bibby (1994), little formal research has been conducted to inventory and document traditional resources important to American Indian people. A parkwide ethnographic overview was prepared during the 1970s, but needs to be revised based on currently available information. Some ethnohistory studies, focusing primarily on Yosemite Valley and El Portal, have also been conducted.

The National Park Service consults with American Indian people about management of park lands, especially regarding undertakings and park resources of concern. Some of the primary concerns are access to park areas; gathering of plant materials for food, medicinal, and utilitarian purposes; protection of archeological and burial sites; and interpretation of Indian culture and prehistoric and historic lifeways. The National Park Service is required to consult on the basis of Government-to-Government Relations with federally recognized Indian tribes, and on a more informal basis with nonfederally recognized tribes. There is no ethnographic information or direct historical data related to American Indian occupations at the Cascades Diversion Dam Removal Project area. People would most likely have passed through the area while traveling between Yosemite Valley and the lower elevations of the Merced River gorge, and ethnographic resources could occur within the project area and the gorge, such as plant material traditionally gathered for basketry, food, ceremonies, insect repellant, etc. Plants and materials that are or could be present within the project area and downstream include willows, wormwood, bracken fern, manzanita, bay leaf, clump grass, tulle reeds, and mushrooms (NPS 2003a).

Cultural Landscape, including Historic Sites and Structures

Cultural landscapes are the result of the long interaction between people and the land, and the influence of human beliefs and actions over time upon the natural landscape. Shaped through time by historical land use and management practices, as well as politics and property laws, technology, and economic conditions, cultural landscapes provide a living record of an area's past, a visual chronicle of its history. The dynamic nature of modern human life contributes to the continual reshaping of cultural landscapes, making them a good source of information about specific times and places, but at the same time rendering their long-term preservation a challenge.

Based on a cultural resources inventory completed in support of the reconstruction of El Portal Road, the National Park Service, in consultation with the State Historic Preservation Officer, determined that the Merced Canyon Travel Corridor is a significant historic property, eligible for listing in the National Register of Historic Places. The primary element of this property is El Portal Road itself, originally constructed as a wagon road in 1905, and substantially reconstructed in 1925. The road includes hand-laid stone parapet guardwalls and drainage catchment structures. Following consultation with the State Historic Preservation Officer and the Advisory Council on Historic Preservation, the majority of these features were documented and removed as part of the El Portal Road Improvement Project. Remaining features include rock quarries, historic trash scatters, sections of pre-1925 roadbed, historic work-camp sites, and the Arch Rock Entrance

Station complex (eligible for the National Register as an individual property), which consists of a ranger residence/office, entrance kiosk, parking lot, and restroom building.

The Merced Canyon Travel Corridor determination of eligibility document (NPS 1997e) describes the important landscape characteristics of this property: "...the views of the Merced River Canyon, the use of natural materials, and purposeful design of situating the travel corridor in sympathy with the natural landscape."

Another historic resource in the gorge includes the structures and features associated with the Yosemite Hydroelectric Power Plant (also known as the Cascades Powerhouse). Structures included within the historic property listing are the diversion dam, the intake, screens and screenhouse, the penstock, the surge tank, the powerhouse and equipment, and the 11-kilovolt distribution line into Yosemite Valley. Some of these features were removed during the 1980s, but some elements still remain, including the dam, the abutments that flank the dam, the intake structure, and the screenhouse. Other remaining elements of the former hydroelectric generating facility include part of a penstock that historically conveyed water from the dam to the powerhouse (nearly all of the penstock has been removed), the powerhouse, and the transmission lines, all of which are more than a mile downstream from Cascades Diversion Dam. Today the powerhouse is used as a transfer facility from Pacific Gas and Electric Company transmission lines to National Park Service transmission lines. The dam, abutments, intake structure, and screenhouse remain as they were when decommissioned in 1985. Also considered contributing to this property are the five Cascades residences and garages north of El Portal Road, constructed between 1917 and 1924. These structures are not being used and are schedule for removal under the *Yosemite Valley Plan*. These structures are located outside of the Cascades Diversion Dam project area.

A historic site consisting of a linear road feature of four segments is located immediately south of El Portal Road and north of the river, downstream of Cascades Diversion Dam. The resource is a segment of Coulterville Stage Road, completed to Yosemite Valley in the summer of 1874, and joined with El Portal Road west of Cascades Picnic Area in 1907. Some portions of this site are obliterated or obscured by road fill from El Portal Road, located immediately north and above Coulterville Stage Road (NPS 1997d). The Yosemite section of Coulterville Stage Road is considered an important historical resource and, as such, is listed in the National Register of Historic Places.

Social Resources

Transportation

Yosemite Roadway System

Regional highways leading into Yosemite National Park (State Routes 41, 120, and 140) transition into the internal parkwide road system; there are no state highways within the boundaries of the park, though state route numbers are used on park signs to help orient visitors. Two of these roadways are within the project area; Big Oak Flat Road meets El Portal Road opposite the dam site. El Portal Road continues east into Yosemite Valley.

El Portal Road is about eight miles long within the park. Outside the park boundaries, this road connects to State Route 140. El Portal Road enters the park at the El Portal Administrative Site, passes through the Arch Rock Entrance Station, and joins Big Oak Flat Road one mile west of Pohono Bridge. It is maintained for year-round access. The road is characterized by steep, rocky canyon walls with small river flats and terraces and has a typical pavement width of 27 feet.

Big Oak Flat Road is about 18 miles long. It leads from the Big Oak Flat Entrance Station through Hodgdon Meadow and Crane Flat, and joins El Portal Road one mile downstream from Pohono Bridge. (Big Oak Flat Road also provides access to the Valley from the Tioga Pass entrance.) Outside the park, this road connects to State Route 120. Big Oak Flat Road may be used as a through route in conjunction with other major park roads and is maintained for year-round access. The topography changes from mountainous on the east end of the road to rolling at the west end. The paved roadway width ranges from 22 to28 feet.

Traffic Conditions

Daily traffic volumes recorded at fixed counter locations within the park indicate a trend of steady growth in traffic, but traffic volumes do not exceed the capacity of El Portal Road or Big Oak Flat Road. The only stop sign in the project vicinity is adjacent to the dam and is for traffic turning in either direction onto El Portal Road from Big Oak Flat Road. This intersection occasionally experiences moderate congestion on busy summer days.

Transit and Tour Bus Services

While bus transportation in Yosemite National Park includes public transportation, charter and tour bus operations, concessioner-operated tours, and shuttle bus services operated by the park concessioner, there are no bus stops within a mile of Cascades Diversion Dam. Charter and tour buses frequently travel to and from Yosemite Valley on El Portal Road and Big Oak Flat Road.

Parking Facilities

There is a small parking lot located approximately 20 feet east of the El Portal Road and Big Oak Flat Road intersection. This lot has room for roughly 12 automobiles. There is no pedestrian crosswalk or traffic control for pedestrians to cross the road towards the dam intake and the river. In addition, there is an informal turnout on the river-right side of El Portal Road immediately downstream of Cascades Diversion Dam. This area has room for approximately five cars. Neither the parking lot nor turnout has marked parking spaces, and parking in the project area is not in high demand. These areas are typically used for short-term private automobile parking and are not typically used by tour buses. The parking area may be used during winter as a location for putting on or removing tire chains and as a snowplow turnaround. The parking area may also be used as an equipment staging and traffic control area for road closure activities or for heavy equipment staging for nearby maintenance operations, such as clearing landslide debris. The parking area and turnout may also be used by visitors orienting themselves to park destinations (i.e., consulting maps) or by visitors with disabled vehicles. The entrance to Pohono Quarry from El Portal Road is within an informal turnout that may be used by visitors to access the Merced River.

Scenic Resources

Visual resources within the project area and the V-shaped Merced River gorge are somewhat limited because of the steep terrain and forest cover. However, some views of dramatic rock formations are available from the Cascades Diversion Dam project area. Pulpit Rock can be seen on the south wall of the gorge approximately 0.25 mile downstream of the dam, and the Rostrum can be seen approximately 1.25 miles downstream. In the late 1970s, the National Park Service conducted a visual analysis that identified the 11 most important features within Yosemite Valley, in terms of the landscape features most visitors look for and are able to distinguish. Two of those features, Bridalveil Fall and Cathedral Rocks, are partly visible from the banks of the Merced River in the vicinity of the dam and from the dam intake structure, although obscured in part by intervening vegetation. The slope of the riverbed in the vicinity of the dam is relatively steep (USBR 2001), producing visually dramatic rapids among the rocks and boulders downstream of the dam during high water flow. Upstream, the impounded river is flat and wide behind the dam. As described in the Merced River Plan, the dam, abutments, and screenhouse constitute human-made historic structures that intrude into the views from within the Merced River corridor; these structures do not, however, dominate the natural landscape from any viewpoint. Pohono Quarry is not visible from El Portal Road or the Merced River due to dense forest cover in this area.

Big Oak Flat Road meets El Portal Road opposite the dam site. This junction of two major park roads gives this section of the river corridor added visibility. Although no formal hiking trails follow the river here, a parking area located on the north side of El Portal Road just east of the Big Oak Flat Road junction affords access (for visitors in private vehicles) to this part of the river, for viewing and other recreational purposes.

The reach of the river that includes the dam site is identified as Scenic B in the Yosemite Valley Scenic Analysis map that was prepared for the Merced River Plan (2001a). This classification indicates that this area is "included in scenic views less commonly chosen by historic photographers and painters, or compose[s] less significant modern views, based on park management observations" (NPS 2001a).

Recreation

There are no formalized recreation opportunities within the project area. Recreation activities near Cascades Diversion Dam include sightseeing, picnicking, swimming, fishing, climbing, and non-motorized watercraft use. Groups occasionally use the parking lot near Cascades Diversion Dam as a meeting place and then proceed to other areas of the park.

Sightseeing

Sightseers use the Cascades Diversion Dam intake structure to view the river and rock formations of the Merced River gorge. It was not, however, the intention of the park to create a public viewpoint at this location, and there is no pedestrian crosswalk from the parking lot north of El Portal Road to the intake structure. While there are no formal hiking trails near the dam, visitors are known to walk on the dam's wooden crest and the exposed riverbanks and rocks when water levels are low. Visitors also use vehicle turnouts to access the river for sightseeing activities.

Picnicking

The Cascades Picnic Area is approximately one mile downstream from the dam. The nearest picnic areas upstream – Cathedral Beach and El Capitan – are more than two miles from the dam. Informal picnicking near Cascades Diversion Dam takes the form of lunch on riverside boulders, at the parking area near the dam, or at roadside turnouts.

Swimming

During the summer, visitors and residents swim in the Merced River gorge, although a sign on the intake structure railing prohibits swimming near Cascades Diversion Dam. The National Park Service does not officially designate swimming areas. However, there are numerous known swimming holes along the Merced River downstream to an area known as Steamboat Bay and to Arch Rock, some more accessible than others.

Fishing

Though a sign on the intake structure railing prohibits fishing near Cascades Diversion Dam, visitors enjoy fishing other stretches of the Merced River near the dam. Only brown trout and rainbow trout are sufficiently common for routine fishing in the Merced River. Fishing in Yosemite National Park is bound by the same regulations that apply elsewhere in the state and are enforced by the National Park Service.

Climbing

Rockclimbing regularly occurs within the Merced River gorge. Most climbing takes place at the Rostrum, Steamboat Bay, and the Cookie (east of the Arch Rock Entrance Station) in the spring and fall, when higher elevations are unavailable due to inclement weather. Climbing groups are known to park near Cascades Diversion Dam and then hike to a climbing site approximately one-half mile up Big Oak Flat Road.

Non-Motorized Watercraft

Very little rafting and kayaking occurs near Cascades Diversion Dam, while a limited amount of white-water rafting and kayaking takes place downstream along the Merced River in the El Portal area. Since approximately 1984, commercial rafting operations have launched rafts just downstream of Red Bud Picnic Area (outside of El Portal) through an agreement with the Bureau of Land Management. Private rafters also launch near the gas station in El Portal, although this is not a heavily used area.

Orientation and Interpretation

There are no formalized orientation opportunities within the project area; however, information regarding general trip planning and orientation is available from a variety of sources.

Orientation

Yosemite's web site provides information about park lodging and activities, safety, resource protection, and accessibility. The park's public information office mails pre-visit materials to those requesting them by phone, fax, or mail. The Yosemite Association also offers an interactive

web site and sells Yosemite-related publications and other interpretive resources. The park provides updated information, publications, and seasonal staffing to local, multi-agency visitor centers where visitors can stop en route. Once at park entrance stations, visitors receive free park publications with trip and activity planning information, including the *Yosemite Guide* and *Yosemite Today* newspapers. During the summer and early fall, contact stations in Wawona and Big Oak Flat are staffed to provide additional assistance, and a visitor center is open during the summer in Tuolumne Meadows.

Wayfinding in areas near Yosemite Valley can sometimes be challenging, as the main visitor center is located toward the east end of the Valley. The park's free publications distributed at entrance stations contain maps and wayfinding information. Visitors can also gain limited information from roadside signs throughout the park, such as those at the El Portal Road and Big Oak Flat Road intersection adjacent to Cascades Diversion Dam.

Interpretation

The Division of Interpretation in Yosemite assists people in making connections to the park through a program of guided walks and talks, curriculum-based education, informal interactions along trails, dramatic presentations, cultural demonstrations, off-site talks to gateway communities, public open houses, media relations, as well as exhibits, publications, signs, and films. Interpretation facilities are vital components of the National Park Service mission to foster enjoyment, education, and inspiration. Interpretation aims to inspire people to gain a greater understanding of themselves and the world through their national park experience. There are no formalized interpretation activities at Cascades Diversion Dam.

Socioeconomics

The affected socioeconomic region includes Madera County, Mariposa County, and Tuolumne County, the three counties in which Yosemite National Park is located. The *Yosemite Valley Plan* provides a socioeconomic profile of the regional economy for 1996 that presents the size of each county's principal economic sectors in terms of population, employment, and output. Output data have been updated based on trends in local area personal income provided by the U.S. Bureau of Economic Analysis through the year 2000 (the most recent data available for the area). The resulting estimates for 2000 provide a reasonable socioeconomic profile of the three-county region, given that it has not experienced any significant structural changes to its economy since 1996. Employment data for 2000 is provided by the California Employment Development Department.

Regional Economy

Population

In 2000, the total population of the three-county affected region was approximately 194,740 (see table III-2). Madera County is the most populous county, with roughly 123,109 residents. Mariposa County has a total population of approximately 17,130 residents.

Table III-2
Population By County

County	Population (2000)
Madera	123,109
Mariposa	17,130
Tuolumne	54,501
Total	194,740

SOURCE: U.S. Bureau of the Census 2002

Employment

The employment figures include all waged, salaried, and self-employed jobs in each county, and both full-time and part-time workers. In 2000, total employment was approximately 60,040 in the three-county area. Approximately 65% of the total employment in the affected region was in Madera County. Mariposa County accounted for approximately 8% of total employment in the affected region. Table III-3 provides total employment estimates for the counties by industry sector.

Table III-3
2000 Employment By Major Industry Sector

Industry Sector	Madera	Mariposa	Tuolumne	Total[a]
Agriculture	11,900	10	180	12,090
Construction & Mining	1,600	140	980	2,720
Manufacturing	3,400	180	1,250	4,830
Transportation, Public Utilities	1,100	90	430	1,620
Trade (Wholesale & Retail)	5,700	690	3,800	10,190
Finance, Insurance, Real Estate	600	90	530	1,220
Services	7,500	1,970	4,230	13,700
Government	7,600	1,730	4,540	13,870
Total	39,200	4,890	15,950	60,040

[a] Totals may not exactly compute due to rounding.

SOURCE: California Employment Development Department 2002

Output

Economic output is a measure of productivity. Measures of economic output vary depending upon the industry sector. For the agricultural, wholesale trade, and retail trade sectors, output is measured by the value of products sold. In the manufacturing sector, output is a measure of the value added by the manufacturer or the value of shipments. In the service sector, output is measured as receipts in dollars.

The estimated total output of goods and services for the three-county affected region in 2000 was about $6.9 billion (2000 dollars) (see table III-4). Madera County accounted for approximately 66% of total economic output in the affected region. Mariposa County, which had the smallest economy in the affected region, accounted for approximately 7% of output. Based on output, manufacturing was the largest economic sector in the three counties.

Table III-4
2000 Economic Output By County and Industry Sector (in Millions of 2000 Dollars)

Industry Sector	Madera	Mariposa	Tuolumne	Total[a]
Agriculture	$ 1,080.6	$ 28.3	$ 44.3	$ 1,153.2
Construction & Mining	$ 322.5	$ 54.1	$ 234.2	$ 610.8
Manufacturing	$ 989.1	$ 53.0	$ 345.4	$ 1,387.5
Transportation & Public Utilities	$ 434.8	$ 65.5	$ 199.6	$ 699.9
Trade (Wholesale & Retail)	$ 280.9	$ 17.8	$ 122.4	$ 421.2
Finance, Insurance, Real Estate	$ 494.7	$ 103.2	$ 315.9	$ 913.8
Services	$ 579.5	$ 59.2	$ 371.4	$ 1,010.1
Government	$ 363.7	$ 89.4	$ 243.5	$ 696.6
Total	$ 4,545.8	$ 470.5	$ 1,876.8	$ 6,893.1

[a] Totals may not add up exactly due to rounding.

SOURCES: Micro IMPLAN Group 1996, adjusted according to U.S. Bureau of Economic Analysis trends in personal income

Taxable Retail Sales

Taxable retail sales are good indicators of annual spending in the travel-service sectors, since they represent the taxes paid for transactions with consumers. The total taxable retail sales figures include the taxes paid by businesses on raw materials and services. In 2000, the total taxable retail sales for the affected region was approximately $1.5 billion (2000 dollars). Madera County accounted for about 58% of total taxable retail sales. Mariposa County accounted for about 8% of total taxable sales. Table III-5 shows total taxable retail sales by county.

Table III-5
2000 Total Taxable Retail Sales By County (in Millions of 2000 Dollars)

County	Total Taxable Sales
Madera	$881.0
Mariposa	$127.3
Tuolumne	$500.8
Total	$1,509.1

SOURCE: California State Board of Equalization 2002

County Profiles

Madera County. The central economic activity in Madera County is agriculture, which constitutes nearly one-third of the county's total employment and over 24% of the county's economic output (see tables III-3 and III-4). The agricultural sector stimulates production in related sectors of the economy, including jobs in food processing, transportation, and wholesale trade.

In Madera County, the construction and mining sector accounts for over 4% of employment and over 7% of total economic output in the county (see tables III-3, and III-4).

Mariposa County. Recreation and tourism are major industries in Mariposa County. The county's primary recreation area/tourist attraction is Yosemite National Park, much of which lies within the county, including the developed areas of Yosemite Valley. Major recreation areas in Mariposa

County include Stanislaus National Forest and Sierra National Forest, including the U.S. Forest Service/Bureau of Land Management managed recreation areas along the Merced River.

The services sector accounts for approximately 40% of employment and 22% of economic output in Mariposa County. Government is also a major economic sector in the county, accounting for 35.4% of employment and 19% of total output. The finance, insurance, and real estate sector accounted for 22% of economic output, although only about 2% of total employment. In Madera County, the construction and mining sector accounts for only 3% of county employment and 11.5% of total economic output in the county (see tables III-3 and III-4).

Tuolumne County. Yosemite National Park is in the southeastern portion of Tuolumne County and Cascades Diversion Dam is easily accessible from Tuolumne County, via Big Oak Flat Road. The government sector was the largest employer in the county in 2000, accounting for 28.5% of employment and 13% of economic output (see tables III-3 and III-4). The services sector accounts for 26.5% of employment and 19.8% of the total economic output. Most of the job growth in Tuolumne County is expected in the services, retail trade, construction, and manufacturing sectors. The services sector is expected to create the greatest number of new jobs, reflecting an increased demand for business, health, personal, and hospitality services.

In Tuolumne County, the construction and mining sector accounts for nearly 6% of county employment and 12.5% of total output in the county (see tables III-3, and III-4).

Park Operations

Park facilities and infrastructure in the vicinity of the dam include El Portal Road, Big Oak Flat Road, Cascades Diversion Dam, and Pohono Bridge. Utilities under El Portal Road include a wastewater line (which extends between El Portal and Yosemite Valley), electrical conductors (which extend from a substation at the Cascades Powerhouse to a substation in Yosemite Valley), and a telephone line. There is one public telephone and trash cans at the public parking area on the north side of El Portal Road from the dam. The telephone provides access to the park's emergency response system through 911. The parking lot provides a location for snowplow turnaround, equipment staging and traffic control for road closure activities, and heavy equipment staging. Pohono Quarry is used for staging and materials storage for past and ongoing park projects. Although the dam itself is deteriorated and outdated and was decommissioned as a hydroelectric facility in 1986, the park performs minor repairs on attendant structures such as the safety railing. Minor miscellaneous park operations and facilities equipment, such as traffic cones and signs, are currently stored in the screenhouse.

Park operations and facility staff, particularly the Facilities Management and Resources Management divisions, would be responsible for overseeing contract work undertaken for the project. Facilities Management responsibilities include buildings and grounds, roads and trails, utilities, and design and engineering. Resources Management responsibilities include natural and cultural resource monitoring and evaluation, impact mitigation, restoration, and wildlife management.